

FLYING LESSONS for May 19, 2011

suggested by this week's aircraft mishap reports

FLYING LESSONS uses the past week's mishap reports to consider what *might* have contributed to accidents, so you can make better decisions if you face similar circumstances. In almost all cases design characteristics of a specific make and model airplane have little direct bearing on the possible causes of aircraft accidents, so apply these *FLYING LESSONS* to any airplane you fly. Verify all technical information before applying it to your aircraft or operation, with manufacturers' data and recommendations taking precedence. You are pilot in command, and are ultimately responsible for the decisions you make.

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This week's lessons:

I smoothly advanced the A36 Bonanza's throttle and began our takeoff roll. My student-pilot passenger was in the right seat; the aft cabin was packed with merchandise and equipment, putting the fueled 2002 Bonanza within 50 pounds of its maximum gross weight.

Two months previously I'd completed [BPPP](http://www.bppp.org) for my annual training. My instructor reminded me of a technique I used to teach but had somehow forgotten, hitting the "go-around" button on the throttle to provide a flight director target for initial climb. I'd done so on this takeoff. Among other things, the go-around button disengages the Bonanza's autopilot, so it is another way of ensuring the autopilot is turned off before takeoff.

See www.bppp.org

At liftoff speed I established climb attitude. I'm a "positive rate, gear up" pilot in 28-volt Bonanzas (with a 4.5-second cycle speed), so since the gear was still down I know I was within about 100 feet of the ground when very suddenly it took almost as much as I could muster to pull back on the yoke to maintain attitude. *Runaway trim!* Instinctively I mashed the yoke-mounted Autopilot Disconnect/Trim Interrupt (the "Big Red Button") with my left thumb as I confirmed the engine was fine and I was still at the correct 7° nose up climb attitude. Then I scanned the trim indicator. I had set trim at three units UP before takeoff, in the green arc, but now it was between three and four units DN, or nose down. Still holding the red button, applying *significant* back-pressure on the yoke and maintaining climb attitude, I spun the manual trim back into the middle of the green takeoff arc. Pressures eased; I was still climbing.

It was always possible I'd not set the trim properly for takeoff. I could have mistaken three DN for three UP on the trim wheel. So knowing I was on attitude and heading, I experimentally took my thumb off the Big Red Button. Instantly the trim took off nose-down again, and it took a big pull on the yoke to hold pitch as once more I held the trim interrupt. There was no question: it was a nose-down pitch trim runaway.

Following my well-practiced procedure, I watched the attitude indicator to hold climb and heading, kept the red button mashed down, manually trimmed off the pressure, then leaned right and slapped the right cabin sidewall just under the instrument panel with the back of my right hand. From this known hand position, still holding the Big Red Button and watching my instruments, I felt for the fourth circuit breaker from the right, the second in this airplane with a "collar" that makes it easier to pull, and popped the Servo Power breaker. Sitting back up, confirming the climb, I gingerly took my thumb off the interrupt switch...and nothing happened. Exactly what I had hoped.

Only then did Tower hand me off. I noticed I had not yet retracted the landing gear, so I put away the wheels, then changed to Departure frequency. My greatest surprise was not that the trim runaway occurred, or that my practiced procedure worked as advertised. It was realizing that all this entire experienced happened in a full-power climb before I was 400 feet above the ground.

I always do two things right away when I get into a Beech Bonanza or Baron. First, I check that the manual landing gear handcrank (if you fly Beechcraft you know what I mean). Second, I find the electric trim Servo Power circuit breaker (labeled Pitch Trim in many model years). While sitting upright with my right thumb on the Big Red Button and focusing on the attitude indicator, I go through the practice of slapping the right sidewall, finding the correct breaker, and pulling it out. *Every time I fly.* Even if it's a familiar airplane. If I'm instructing, I make sure I can pull the breaker while watching the attitude indicator from the right seat. I do this because 20 years ago I was leading [FlightSafety International's Bonanza pilot training program](#) at the Beech factory, and we presented the pitch trim runaway scenario on takeoff to all our customers in the Bonanza/Baron simulator. The remote possibility of a fast, powerful and extremely hazardous failure became a preventive check every flight—one that lasted 20 years of practice before I found myself needing to know the procedure cold.

See www.flightsafety.com/fs_location_center.php?c=1132&r=G&ce=0&site_unique=166151794dd48a2373be32.83427212

You're probably flying some other type of aircraft, so you need to learn the procedure that applies in what you fly. If you don't have an autopilot or electric trim, you don't need to worry. If it does, dig into the Pilot's Operating Handbook (POH) and its Supplements.

Current design philosophy omits a manual trim system in modern airplane design, presumably to save weight and complexity. Had the same thing happened in a Cirrus, Diamond, many light jets, some legacy designs like the Piper Aerostar, and most Light Sport airplanes, the pilot can remove electrical power and stop the trim, but there is *no way* to relieve the trim pressures. He/she would have to complete the flight, possibly in IMC, with a radically out-of-trim airplane. I personally think that's a major oversight in airplane design.

If you're flying an airplane without manual trim, insist your instructor present a scenario where the airplane is radically out of trim, and you need to hand-fly the flight through a successful approach and landing. If you're instrument rated, do it under the hood. Very carefully brief the syllabus before you fly, including ways to break off the maneuver if needed. You may not want to actually land in this condition during practice. Seek an expert on your airplane type to be your mentor for this vital preparation for a possible emergency.

It's very helpful (as I found) to put a collar around the trim circuit breaker so you can identify it more easily by touch and then pull it out without looking. If you're flying somebody else's airplane you can wrap a bread-tie around the breaker for quick identification.

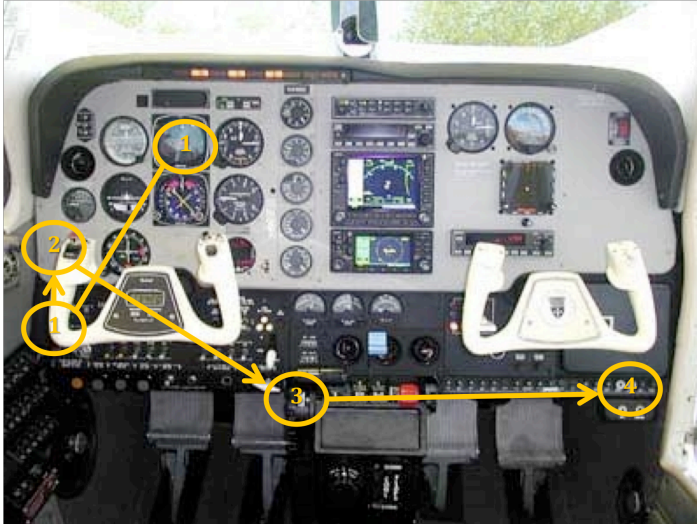
It's funny, but I absolutely remember going through this exercise when I first sat in the Bonanza that morning. I even recall thinking "this is a ritual I do every flight." But I was disciplined to do the check, and it may have saved my life (and my passenger's) that day.

My student-pilot passenger told me as we climbed away he knew something was wrong, so he wisely leaned back and kept quiet to stay out of my way. Good passenger! He asked what would have happened if I'd not caught the emergency, so soon after liftoff, or if I hadn't known precisely what to do. "We'd have hit in the runway overrun, probably nose-first, and hard," I told him. I remarked we would have tested the function of that A36's [AmSafe](#) air-bag shoulder harnesses.

See www.amsafe.com

All our preflight inspection items, checklist steps and practice emergency procedures are much more than mere rituals we perform out of habit. Each is a skill you may never need—or may need today, 50 feet above ground as the end of the runway disappears behind you. Practice often, and don't dismiss vital safety skills as mere formalities placed between you and the sky.

Comments? Questions? Tell us what you think at mastery.flight.training@cox.net.



Autopilot Malfunction/ Pitch Trim Runaway Procedure

From the POH Autopilot Supplement. Adjust as necessary to the individual aircraft. See your Supplement for details.

1. Maintain control of the aircraft (this may require considerable force on the controls).
2. Depress and HOLD the Autopilot Disconnect/Trim Interrupt button on the pilot's control yoke.
3. Trim the aircraft using the manual trim wheel.
4. Pull the SERVO POWER or PITCH TRIM circuit breaker.
5. Release the Autopilot Disconnect/Trim Interrupt button.
6. If the electric trim continues to run, turn OFF the Battery and Alternator switch(es) and follow the Total Electrical Failure procedure.

Removing electrical power from the trim servos will resolve an autopilot malfunction or electrical trim system failure. The aircraft may be hand-flown using manual trim.

Sample Autopilot Malfunction/Electric Trim Runaway Procedure (1984 – 2005 A36 Bonanza)

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Debrief: Readers write about recent *FLYING LESSONS*:

A reader who wishes to remain anonymous writes about our on-going discussion about the goals of pilot training:

I would like to comment on "teaching good judgment and solid flight discipline...at all levels of experience". This concept is far from the mark. Actually this type of pragmatic thinking has held GA back for years.

There is no way to teach good judgment (read ADM) or solid flight discipline (read professionalism). If you listen to any current Human Factors theory this becomes quickly evident. Errors occur on normal flights in normal conditions to normal people without the participant catching them. If they do see their error and correct it in a timely manner no accident occurs. Risk is always there.

It is error *recovery* and *avoidance* that will get us to the lowered fatal accident rate. In hindsight observers (Investigators) quickly assign their view to why accidents happen. They were not there and not capable of untangling the complex psychological dynamics of choice. These "number counters" never produce effective theories. In the worldview they become comfortable that "data" and "drill down" will spot the issues so that more procedures can be incorporated. This is far from effective and why the accident rate has stayed stagnant for the last 11 years.

The technical knowledge pool of the instructors and their effectiveness as educators lies at the start to the solution. If any pilot has a solid understanding of aircraft systems, rules, aerodynamics and airspace on any normal flight on a normal day their performance will prevent accidents. They will catch errors and correct themselves in the future. If the instructor spends time finding out why the student wants to fly and corrects his patterns of risk avoidance and recovery the discipline issue will be addressed.

Everyone is frustrated because the rate is 1.2/100,000 [estimated hours flown] and has stayed stable for so long. The folks who live on data and aircraft operators do not know what to do next. They try to feel comfortable that numbers are the answer. Past is not prologue. They want to look over their shoulders and predict the future accidents. However, the thought process of the pilot is not evident in collecting numbers. There are far too many variables. Ask any Human Factors person.

Thank you, reader. I think we're not too far off one another's thinking here. If I understand correctly, you are saying:

1. Simply crunching data from previous accidents will not prevent similar occurrences in the future.
2. Aeronautical Decision Making (ADM) is a necessary component of flying safely, but it is not the only thing. We still need to focus on basic airmanship, stick-and-rudder flying, and type-specific systems knowledge. New efforts at reducing the rate of fatal accidents should include ADM *in addition to*, not in place of, stick-and-rudder/airmanship training.

See my articles:

[Having FITS](http://www.aero-news.net/news/featuresstories.cfm?ContentBlockID=B31853EE-E2C3-4756-A32B-F031E0FC1391&Dynamic=1) (www.aero-news.net/news/featuresstories.cfm?ContentBlockID=B31853EE-E2C3-4756-A32B-F031E0FC1391&Dynamic=1)

[Learning by FITS and STARTS](http://www.jpilot.com/learn/article.aspx?ArticleID=918) (www.jpilot.com/learn/article.aspx?ArticleID=918)

3. We need to train pilots to avoid hazardous situations, to be sure. But we also need to give them the skills they need to fly out of an emergency—to *recover* when things go too far.
4. Solving the problem of fatal general aviation accidents requires focus and direction on the part of instructor pilots, both with their students and with each other.

Did I understand correctly? Another anonymous reader adds:

I agree with the statement that you quoted: "Serious work needs to be done to teach good judgment and solid flight discipline at all levels of experience. With these the chances of making a right decision when it counts are greatly increased"

Being on the "other side of the fence" now [employed by FAA], I can see plenty of room for improvement. Asking CFI applicants to memorize the laws of learning, and different definitions from the Fundamentals of Instruction (FOI) does nothing to improve the present methods of instructing. I think scenario-based training and teaching CFI applicants how to make good decisions in all aspects of flying is the direction in which we need to move.

Unfortunately, most of this type of training can only be tested subjectively. Many Inspectors are fairly far removed from the world of instruction when they are hired by the FAA. A CFI Practical Test should not be a test on memorization of regulations or the FOI, but on passing along good habits and good judgment.

Thank you. Responding to both anonymous reader comments, I'm left with this (still nebulous) summation: We need to rethink not just *what* we teach, but *how* we teach it.

Readers, what's *your* opinion? Tell us at mastery.flight.training@cox.net.



For several weeks we've concentrated on the seventh most common cause of death in general aviation operations, attempted visual flight in instrument meteorological conditions (IMC). VFR into IMC occurs, we've learned, to nearly as many instrument-rated pilots as not. Although changing the minimum flight hours required for the instrument rating from 250 hours to 125 and then removing it completely over past 30 years has encouraged a much greater percentage of

U.S. pilots to complete an instrument rating, it has not removed VFR into IMC as a leading contributor to general aviation accidents.

After review of several case histories and significant, thoughtful input from *FLYING LESSONS* readers, it remains difficult to sum up the lessons learned from this seventh most common cause of GA deaths.

One tool is the [Categorical Outlook Flying™](#) decision-making matrix, from the Mastery Flight Training website. It's designed to help you focus on the specific weather conditions observed or forecast before and during flight, and make informed go/no-go decisions as a result. [This article](#) explains how to use the Categorical Outlook Flying™ technique. For help developing more defined personal rules for flying visually in low-visibility and/or ceiling conditions read my article "[Running Scud](#)".

See:

www.thomaspturner.net/Categorical%20outlook%20matrix.htm
www.ipilot.com/learn/article.aspx?ArticleID=707
www.ipilot.com/learn/article.aspx?ArticleID=162

The ultimate fix, if there is one, is to honestly evaluate weather conditions for your route of flight, then divide that route into short segments. Each short segment should have at least one adequate airport for landing; you should know beforehand the minimum safe altitude for each segment, and decide before moving on to the next whether you can safely maintain altitude and course in the next. If not, or if at any time conditions begin to approach your minimums (note I didn't say "if you find yourself in the clouds"; that's far too late), turn around or land at the nearest alternate airport that you can reach at a safe altitude. Use your autopilot if you have one, and *slow down* to give yourself more reaction time in reduced visibility. If you're completely trapped, trim for a wings-level climb to avoid obstacles, then call Air Traffic Control for help getting back down. Penetrate controlled airspace if that's what it takes; you can work out the details with regulators later, and it's far better to temporarily lose your license than to permanently lose your life.

If it's at all possible and the airplane is equipped, file IFR and forget about scud-running. If you're making a positioning flight, moving the airplane to an airport from which your "real" trip will commence, plan and execute the positioning flight with the same care you would any other cross-country trip. Just because the distance is short or you're flying Part 91 to get in position for a commercial flight does not mean the conditions are any less hazardous. In fact, there is ample evidence to the contrary.

Read also: [Nighttime Risk Management](#); [VFR Flight Not Recommended: The Go/No-Go Decision](#)

See:

www.avweb.com/news/leadingedge/leading_edge_22_night_vfr_risk_management_198718-1.html
www.avweb.com/news/leadingedge/leading_edge_15_vfr_flight_not_recommended_197188-1.html

Next week, we'll begin our look at ways to avoid the sixth most common cause of fatal general aviation accidents. Any guesses about what it is?

Readers will recall *FLYING LESSONS'* focus on angle of attack awareness in past issues, and discussion of angle of attack indicators that are now available for piston-powered general aviation airplanes. Among others, readers Fred Scott, Tom Rosen and Charles Lloyd (who readers might recall gave me my introduction to AoA indicators last winter) have begun a serious campaign to bring AoA information to lightplane pilots. After all, AoA is the name of the game both for maximum airplane performance and stall/spin avoidance; it is the standard in turbine operations and military flying, but almost unheard of save for glancing references in aviation texts and Federal standards that still make it appear an airplane will stall at its published V_{so} regardless of the airplane's weight, configuration, power setting and G-load.

Perhaps because of these pilots' zeal, or perhaps through coincidence alone, four articles on angle of attack indicators have appeared in major aviation periodicals in recent weeks (two penned by Lloyd and one co-authored by Scott). Fred Scott has [posted links to all four articles](#) on his website. It's worth a look.

See www.ballyshannon.com/aoaarticles1.html

Pilot Training Reform

Jason Blair, executive director of the National Association of Flight Instructors (NAFI), joins the call for instructor professionalism in his recent article for the International Association for Flight Training Professionals ([IAFTP](http://iaftp.org)). Although Jason was unable to attend the recent [Reforming Pilot Training symposium](#) in Atlanta, Georgia (he was in a previously scheduled meeting with FAA in Oklahoma City on writing FAA Knowledge Test exams), his comments on [What It Means to be a Professional Flight Instructor](#) would have been equally at place at the Atlanta conference.

See:

<http://iaftp.org>

www.pilottrainingreform.org

<http://iaftp.org/2011/05/what-it-means-to-be-a-professional-flight-instructor/>



Past and present FAA General Aviation Awards National recipients of the Flight Instructor of the Year, Aviation Safety Counselor of the Year, and FAA Safety Team Representative of the Year who took part in the Reforming Pilot Training symposium in Atlanta in early May. I'm at the far left in the back row, hiding behind my esteemed colleagues.

Share safer skies. [Forward FLYING LESSONS to a friend.](#)

Flying has risks. Choose wisely.

Thomas P. Turner, M.S. Aviation Safety, MCFI
2010 National FAA Safety Team Representative of the Year
2008 FAA Central Region CFI of the Year



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